CAPABILITIES OF «CES EDUPACK 2014» SOFTWARE IN TEACHING OF STUDENTS IN «MATERIALS ENGINEERING»

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«CES Edupack 2014» software is a product of company «Granta Design». This software appeared in the universities of Ukraine due to the implementation of the international project MMATENG for reform of curriculum in Materials Engineering. Starting from 2015, this software began to apply in four Ukrainian Universities (Priazovskyi State Technical University, NTU «KPI NTU», NTU «Lviv Polytechnics», Lutsk NTU) in the educational process of training students in « Materials Engineering ». It is an informational and computation basis of the new subject «Selection of Materials», introduced into the adjusted curricula. It should be noted that the CES Edupack developed on the basis of fundamental works and with personal participation of Cambridge University Professor Michael Ashby which is world known in the field of Materials Science. It underlines the high scientific and methodological level of CES Edupack software product.

Besides to direct use in the curricula's discipline «Selection of Materials», CES Edupack gives ample opportunities in the training of engineers in the field of Materials Science. The structure of this software environment is a complex database on materials, technologies for their production and processing, as well as the environmental consequences of their use. Each of these databases can be successfully used as a reference in teaching and

learning (students) of various specialized disciplines in Materials Science, connected with features and properties of special steels and alloys, non-metallic materials, ceramics, composites etc.

CES Edupack's database includes 3921 materials, divided into four groups: Ceramics and Glasses, Metals and Alloys, Polymers, Hybrids (Composites, Foams, Honycombs, Natural Materials). Each of these groups is represented by several subgroups with deeper dividing of materials' base, by alloying system, by the content of various additives, etc. For individual materials the comprehensive information on their chemical composition, properties (physical, mechanical, thermal, electrical, optical, magnetic, durable (specific for each material)) are provided. This allows the use of CES Edupack as a convenient electronic directory for the various types of training activities, including term and theses projection. Acquaintance with the database will help to broaden teachers and students' understanding of on available materials, their properties and fields of use. Above mentioned data allow students to get an overview of the world of materials and their role in modern life.

Ii is importantly, that among the above information, we can find the average cost of the materials, which allows you to compare similar properties materials, evaluating the cost-effectiveness of their usage. Also the information about labeling similar materials presented in various national and international standards is included. This information may be useful for specialists in the field of standardization, working on metallurgical and engineering enterprises.

The modern engineer has to be an ecologically minded person. An important feature of the training of engineers in world-leading universities is increasing attention to the coverage of the environmental consequences of producing, exploitation and processing of various materials. In databases CES Edupack the summarized information regarding the average specific embodied (in production) energy and on the amount of energy greenhouse gases emitted and water consumed is presented. Also the possibility of recycling and life cycle of a material are analyzed in databases. This information allow Ukrainian teachers actively implement environmental components in teaching of various disciplines of Materials Science.

For each of the types of materials CES Edupack provides background information on the various types of testing methods for definitions of specific properties (including performance characteristics). It is given in the form of separate articles with a comprehensive graphic and text materials, which can be widely used in the independent work of students with the dis-

ciplines such as, for example, «Mechanical Properties» and «Physical properties».

It is noteworthy that CES Edupack proposes the complexes information about technologies for production and processing of various materials. All the processes are divided into three groups: «Joining Processes» (59 titles of processes), «Shaping Processes» (138 titles), «Surface Treatment» (53 titles) - totally - 250 items of technology processes. For each of the technologies a graphic image of the process is given; the data about its purpose, process parameters, physical parameters of the finished product (surface), economic indicators (process time, the cost of using equipment and tools, work intensity) are provided. This information can be used in teaching of «Materials Technologies», «Technology of Heat Treatment, Chemical Heat Treatment, and Thermo-Mechanical Treatment of Metals and Alloys», «Perspective Strengthened Technologies of Materials Treatment» and so on. As well as it can be applied in the performance of course and diploma projection. These data are of interest for industrial engineers and can be used during training sessions.

Another area of CES Edupack application in the teaching process is scientific and research work of students. CES Edupack's data can be used as the basis for the selection of materials, for the optimization of their chemical composition and structure, for proper selection of parameters of various technologies of their processing.